

# Bi-Static Active Microwave Remote Sensing of Reflected Signals-of-Opportunity

Completed Technology Project (2012 - 2014)



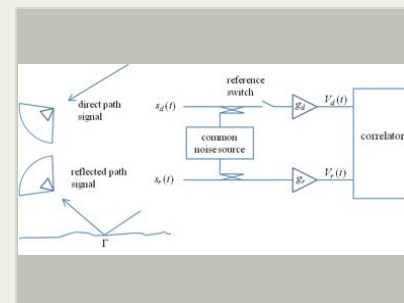
## Project Introduction

An emerging area in microwave remote sensing is to use global navigation satellite service (GNSS) signals, like GPS, to form a bi-static radar by deploying a receive-only (i.e. passive) instrument to measure signals reflected from the Earth's surface. It is possible, and has been demonstrated using XM Satellite radio, to use other existing space borne transmitters. To this end, we propose to demonstrate the use of these so-called signals-of-opportunity (SOP) to perform bi-static active microwave remote sensing of land surfaces. Specially, we will demonstrate the exploitation of geostationary satellite transmissions within the direct broadcast service (DBS) to sense changes in a reflecting surface (e.g., the ground). While past research within the community has focused on using reflected GPS signals to sense ocean winds and soil moisture, there is a paucity of investigation using higher frequencies. We see potential in using multiple satellite downlink frequencies to sense surface properties.

We propose to demonstrate the use of these so-called signals-of-opportunity (SOP) to perform bi-static active microwave remote sensing of land surfaces. Specially, we will demonstrate the exploitation of geostationary satellite transmissions within the direct broadcast service (DBS) to sense changes in a reflecting surface (e.g., the ground). •Develop a RF receiver/interferometer system to receive broadcast signals of DirecTV satellites to perform bi-static active microwave remote sensing of the Earth's surface. •Demonstrate the concept of using signals-of-opportunity (SOp) to perform active bi-static active microwave remote sensing. •Perform proof-of-concept ground measurements useful for sensing soil moisture and vegetation, snow, and sea ice.

## Anticipated Benefits

A data product useful for remote sensing of Earth surface properties (e.g., ice & snow, vegetation).



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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

## Primary U.S. Work Locations

Maryland

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

### Responsible Program:

Center Independent Research & Development: GSFC IRAD

## Project Management

### Program Manager:

Peter M Hughes

### Project Manager:

Terence A Doiron

### Principal Investigator:

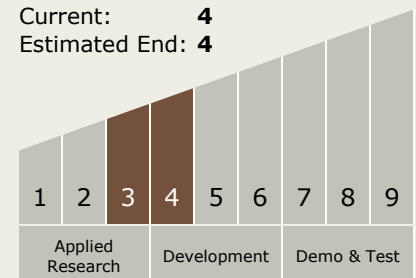
Jeffrey R Piepmeier

## Technology Maturity (TRL)

Start: 3

Current: 4

Estimated End: 4

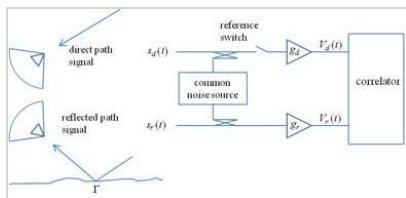


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## Images



### Bi-Static Active Microwave Remote Sensing of Reflected Signals-of-Opportunity

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(<https://techport.nasa.gov/image/4067>)

## Project Website:

<http://sciences.gsfc.nasa.gov/sed/>

## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors